Claims.

1. A resonant magnetometer comprising an oscillatory member and means for passing an alternating current (AC) through said oscillatory member, characterised in that driving means are additionally provided to impart a magnetic field independent oscillatory force to said oscillatory member.

2. A magnetometer according to claim 1 comprising sensing means for providing an electrical output signal dependent on the deflection of the oscillatory member.

3. A magnetometer according to claim 2 wherein the driving means comprises a positive feedback circuit for receiving the electrical signal produced by the sensing means.

4. A magnetometer according to claim 3 wherein the driving means provides an oscillatory force of fixed amplitude.

5. A magnetometer according to claim 3 in which the driving means is arranged to impart an oscillatory force to the oscillatory member of adjustable amplitude, wherein the amplitude of the oscillatory force applied by the driving means is adjusted during use so as to maintain a given amplitude of oscillation of the oscillatory member.

6. A magnetometer according to any one of claims 2 to 5 wherein the means for passing an AC through the oscillatory member comprises a feedback circuit arranged to receive the electrical output signal produced by the sensing means.

7. A magnetometer according to any one of claims 2 to 6 wherein the sensing means comprises at least one sensor electrode located on the substrate and having a variable capacitance with the oscillatory member.

8. A magnetometer according to claim 7 wherein the sensing means comprises a plurality of elongate sensor electrodes located on the substrate and the oscillatory

member comprises a plurality of elongate electrodes interdigitated with said plurality of elongate sensor electrodes.

9. A magnetometer according to claim 8 wherein the electrodes of the oscillatory member are maintained at a predetermined direct current (DC) polarisation voltage.

10. A magnetometer according to claim 8 wherein a high frequency AC polarisation voltage is applied to the electrodes of the oscillatory member.

11. A magnetometer according to any one of claims 8 to 10 wherein said plurality of sensor electrodes are electrically connected to form two electrode sets, the two electrode sets being arranged to provide differential capacitive pick-off.

12. A magnetometer according to any preceding claim wherein the means for passing an AC through the oscillatory member includes means to vary the amplitude of said AC.

13. A magnetometer according to any preceding claim wherein the driving means comprises at least one drive electrode formed on the substrate to electrostatically impart the oscillatory force to the oscillatory member.

14. A magnetometer according to any preceding claim in which the driving means comprises a plurality of first elongate drive electrodes formed on the substrate and the oscillatory member comprises a plurality of second elongate drive electrodes, wherein the first elongate drive electrodes are interdigitated with the second elongate drive electrodes.

15. A magnetometer according to any preceding claim wherein the oscillatory member comprises a resonant beam.

16. A magnetometer according to any preceding claim wherein the oscillatory member comprises at least two flexible leg portions, said AC being passed through at least one of said at least two flexible leg portions.

17. A magnetometer according to claim 16 wherein the oscillatory member comprises a substantially rigid cross-beam arranged substantially perpendicular to, and interconnecting, said at least two leg portions.

18. A magnetometer according to claim 17 wherein the cross-beam comprises a plurality of elongate electrodes protruding perpendicularly therefrom.

19. A magnetometer according to claim 17 or 18 wherein the means for passing an alternating current (AC) through the oscillatory member is arranged to supply a differential AC voltage to said leg portions such that said cross-beam receives the desired polarisation voltage.

20. A magnetometer according to any preceding claim wherein the oscillatory member is arranged to oscillate along an axis in a plane parallel to the plane of the substrate.

21. A magnetometer according to any preceding claim wherein the oscillatory member comprises at least one stress relief means.

22. A magnetometer according to claim 21 wherein the at least one stress relief means comprises a stress relief loop.

23. A magnetometer according to any preceding claim wherein said magnetometer is formed as a micro-electromechanical system (MEMS).

24. A magnetometer according to any preceding claim wherein said substrate and oscillatory member comprise silicon.

25. A magnetometer according to claim 24 wherein said substrate and oscillatory member are formed from any one of a silicon-on-insulator (SOI) wafer and a silicon-on-glass (SOG) wafer.

26. An inertial measurement unit (IMU) comprising at least one magnetometer according to any preceding claims.

27. An IMU according to claim 26 wherein three magnetometers are provided, each of the three magnetometers being arranged to detect magnetic fields along mutually orthogonal axes.